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International Baccalaureate®  
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**BIOLOGY  
HIGHER LEVEL  
PAPER 1**

Wednesday 18 May 2011 (afternoon)

1 hour

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**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. Which hypothesis can be tested using the *t*-test?
  - A. The difference in variation between two samples is not significant.
  - B. The difference between observed values and expected values is not significant.
  - C. The change in one variable is not correlated with a change in another variable.
  - D. The difference between the means in two samples is not significant.
  
2. Which base is connected to its complementary base in a base pair by three hydrogen bonds?
  - A. Uracil
  - B. Thymine
  - C. Guanine
  - D. Adenine
  
3. In which of the following cells can more than one nucleus be found?
  - A. An unfertilized egg
  - B. Neuron
  - C. Sertoli cell
  - D. Muscle fibre
  
4. Which of the following characteristics found in a structure necessarily indicates that it is alive?
  - A. The presence of genetic material
  - B. The presence of a lipid bilayer
  - C. Metabolism
  - D. Movement

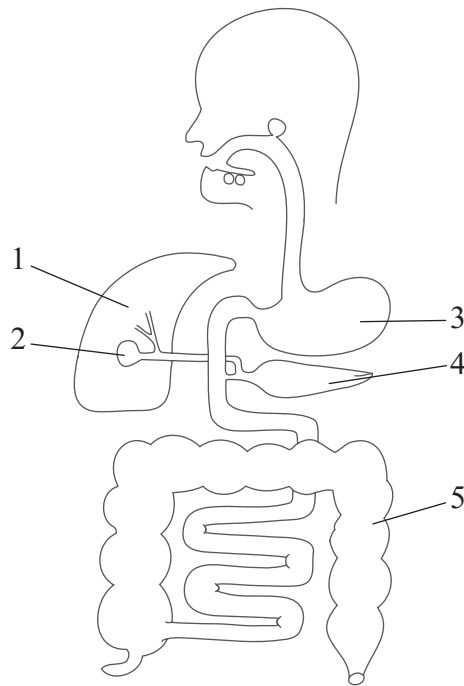
5. Which of the following does **not** occur during interphase?
- A. Replication
  - B. Translation
  - C. Cytokinesis
  - D. An increase in the number of mitochondria

*Questions 6 and 7 refer to the following electron micrograph of a liver cell.*

Graph and questions 6 and 7 removed for copyright reasons

8. What property of water makes it a good evaporative coolant?
- A. High latent heat of evaporation
  - B. Relatively low boiling point
  - C. Volatility
  - D. Transparency
9. What is the difference between galactose and lactose?
- A. Lactose is a disaccharide and galactose is a monosaccharide.
  - B. Lactose is the product of anaerobic respiration in humans and galactose is the product of anaerobic respiration in yeast.
  - C. Lactose is an enzyme and galactose is a hormone.
  - D. Galactose is a sugar found in milk but lactose is not found in milk.

Questions 10 and 11 refer to the following diagram of the human digestive system.



**10.** Which organs are associated with the transformation of glucose into glycogen?

- A. 1 and 4
- B. 2 and 3
- C. 2 and 4
- D. 1 and 3

**11.** Which structure produces lipase?

- A. 1
- B. 2
- C. 4
- D. 5

12. Which molecule is found in both DNA and RNA?
- A. Ribose
  - B. Uracil
  - C. Phosphate
  - D. Amino acid
13. Which process produces the most ATP per molecule of glucose?
- A. Anaerobic respiration in a yeast cell
  - B. Aerobic respiration in a bacterial cell
  - C. Glycolysis in a human liver cell
  - D. The formation of lactic acid in a human muscle cell
14. Which type of light is **least** useful for photosynthesis in terrestrial plants?
- A. Blue
  - B. Green
  - C. White
  - D. Red
15. Between which structures do sensory neurons carry nerve impulses?
- A. From receptors to muscles
  - B. From effectors to the central nervous system (CNS)
  - C. From the central nervous system (CNS) to receptors
  - D. From receptors to the central nervous system (CNS)

16. How many molecules of water are required to completely hydrolyse a polypeptide made up of 23 amino acids?
- A. 11
  - B. 22
  - C. 23
  - D. 44
17. The photosynthetic activity of desert plants is often reduced in the middle of the day. What is the most reasonable explanation for this fact?
- A. Enzymes are denatured by the high temperatures.
  - B. There is not sufficient water for photosystem I.
  - C. Most of the light is reflected by the thick cuticle.
  - D. The stomata close to preserve water and gas exchange decreases.
18. Which of the following is true of the link reaction of aerobic respiration?
- A. The reduction of  $\text{FAD}^+$  occurs.
  - B. The decarboxylation of pyruvate occurs.
  - C. It occurs in the cytoplasm.
  - D. The regeneration of  $\text{NAD}^+$  occurs.



**19.** A collection of four animal specimens is observed and a dichotomous key is applied. Which specimen is an arthropod?

1. Non-segmented body ..... go to 2  
Segmented body ..... go to 3
2. Body is not symmetrical ..... specimen A  
Body is symmetrical ..... specimen B
3. Jointed appendages present ..... specimen C  
Jointed appendages absent ..... specimen D

- A. Specimen A
- B. Specimen B
- C. Specimen C
- D. Specimen D

**20.** How is the polymerase chain reaction (PCR) used?

- A. To make many copies of a DNA molecule
- B. To cut DNA at specific sequences
- C. To splice fragments of DNA together into a plasmid
- D. To separate fragmented pieces of DNA based on their charge and size

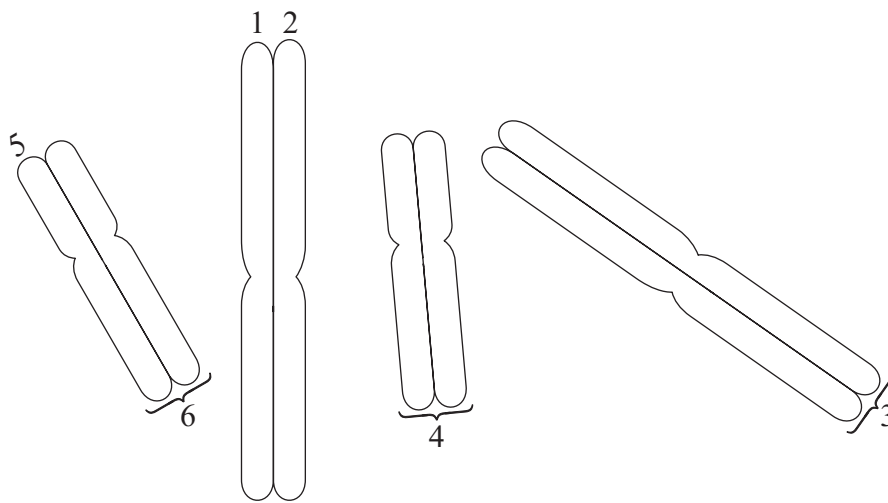
**21.** Which of the following is transported by the blood?

- A. Gametes
- B. Glycogen
- C. Heat
- D. Starch

22. A human cell has between 20 000 and 25 000 genes whereas an *E. coli* cell has approximately 4000 genes. Which of the following statements is true?

- A. The human genome is larger than the *E. coli* genome.
- B. There are more genes on each human chromosome than on the *E. coli* chromosome.
- C. The human cell and the *E. coli* cell produce approximately the same variety of proteins.
- D. The DNA in both organisms is associated with histones (proteins).

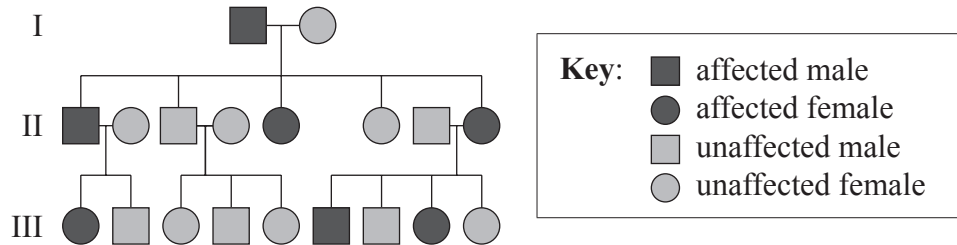
23. In the following diagram, which pair represents homologous chromosomes?



- A. 1 and 2
- B. 3 and 4
- C. 2 and 5
- D. 4 and 6

Questions 24, 25 and 26 refer to the following information.

The ACHOO syndrome is an inherited condition that leads to sneezing in response to bright light and is hypothesized to be inherited in an autosomal (not sex-linked) dominant fashion. The following is a pedigree chart that shows three generations from one family.

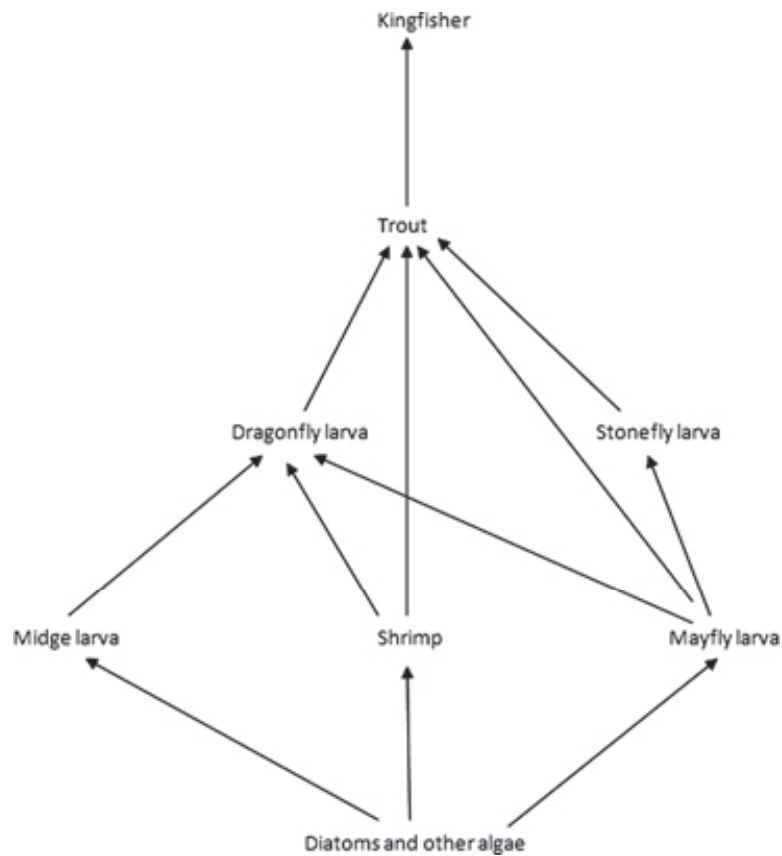


“Autosomal dominant pedigree chart. In Autosomal Dominance the chance of receiving and expressing a particular gene is % regardless of the sex of parent or child.”

Jerome Walker. 22 July 2006.

24. What evidence from the pedigree chart confirms that the ACHOO syndrome is **not** X-linked dominant?
- Four females in the pedigree chart are affected and X-linked conditions do not affect females.
  - There is an affected male in generation II.
  - There is an affected female in generation II.
  - If the condition is X-linked dominant, the affected mother in generation II could not produce an unaffected son.
25. If the ACHOO syndrome is inherited as an autosomal **dominant** condition, what is the probability that a heterozygous father and an unaffected mother produce an unaffected child?
- 0%
  - 25 %
  - 50 %
  - 100 %
26. Which of the following would be possible **only** if the ACHOO syndrome is inherited as autosomal **recessive**?
- Two unaffected parents have a child with the condition.
  - At least one parent has to be affected to produce children that have the condition.
  - An affected and an unaffected parent have an affected child.
  - Two unaffected parents have no affected children.

Question 27 refers to the following diagram.



27. What do all of the organisms in the diagram represent when considered together?

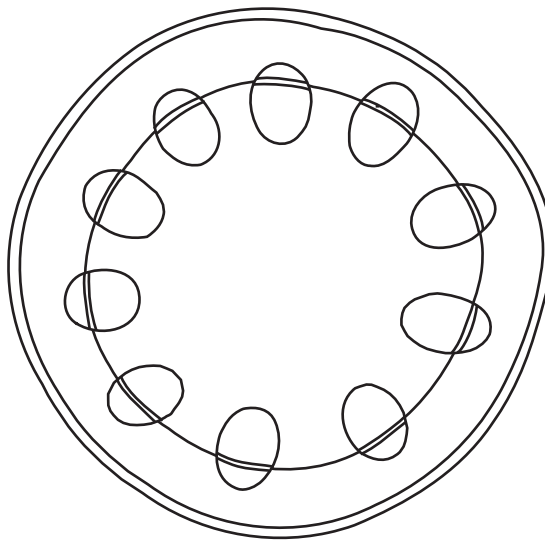
- A. A food chain
- B. A population
- C. A community
- D. An ecosystem

28. Which of the following represent homologous features?

- A. Wings in birds and insects
- B. The appendix in humans and horses
- C. Fins in fish and wings in birds
- D. The striped coat of the zebra and the tiger

- 29.** Which of the following ecological units includes abiotic factors?
- A. A community
  - B. An ecosystem
  - C. A population
  - D. A trophic level
- 30.** In which process are Okazaki fragments created?
- A. Replication
  - B. Transcription
  - C. Translation
  - D. Meiosis
- 31.** Where does the RNA polymerase bind during the process of transcription?
- A. The polysome
  - B. The operator
  - C. The promoter
  - D. The initiator
- 32.** What is a difference between cohesion and adhesion?
- A. Only adhesion is involved in transpiration pull.
  - B. Only cohesion is involved in the movement of water in soil.
  - C. Only cohesion involves the interaction of water with soil mineral particles.
  - D. Only adhesion involves the interaction of water with xylem.

33. Which hormone is involved in the closing of stomata?
- A. Absciscic acid
  - B. Auxin
  - C. Gibberellin
  - D. Indoleacetic acid
34. Plants develop brightly coloured flowers to attract animals. Which process is directly assisted by this adaptation?
- A. Seed dispersal
  - B. Pollination
  - C. Fertilization
  - D. Germination
35. Which structure is shown in the following image?



- A. A dicotyledon stem
- B. A monocotyledon stem
- C. A dicotyledon root
- D. A monocotyledon root

36. What part of the human body is most similar in function to the spongy mesophyll layer in a leaf?
- A. Alveoli in the lungs
  - B. Erythrocytes in the blood
  - C. Villi in the small intestine
  - D. Sweat glands in the skin
37. The umbilical artery carries blood from the fetus to the placenta and the umbilical vein carries blood from the placenta to the fetus. How does the composition of the blood in the umbilical artery and the umbilical vein differ?
- A. Blood in the umbilical artery contains less glucose than blood in the umbilical vein.
  - B. Blood in the umbilical artery contains less carbon dioxide than blood in the umbilical vein.
  - C. Blood in the umbilical vein contains less oxygen than blood in the umbilical artery.
  - D. Blood in the umbilical vein contains more urea than blood in the umbilical artery.
38. What happens when ATP binds to myosin heads during muscle contraction?
- A. Calcium ions are released from the sarcoplasmic reticulum.
  - B. Calcium ions are taken up by the sarcoplasmic reticulum.
  - C. Cross-bridges between myosin heads and actin filaments are broken.
  - D. Myosin heads form cross-bridges with actin filaments.
39. A blood clot forms around a fibrous network of protein. What is the protein?
- A. Fibrinogen
  - B. Fibrin
  - C. Thrombin
  - D. Thrombokinase

- 40.** What is a difference between human sperm and human egg cells?
- A. Sperm have more chromosomes.
  - B. Sperm have a larger surface area to volume ratio.
  - C. Eggs have an acrosome.
  - D. The division of the cytoplasm in sperm production is uneven.
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